Claims

1. A method for treating a waste stream in a waste treatment system, the method comprising the steps of:

operating an oxyhydrogen gas generator within the waste treatment system to produce oxyhydrogen-rich gas;

contacting at least a portion of the waste stream with at least a portion of the oxyhydrogen-rich gas to conduct a unit process for treating the waste stream; and

conveying at least a portion of the oxyhydrogen-rich gas for a second use in the waste treatment system.

2. The method of claim 1 wherein the waste stream includes a water component, and the operation of the oxyhydrogen gas generator produces oxyhydrogen-rich gas from the water component of the waste stream.

3. The method of claim 1 wherein the waste stream includes a water component, and further comprising:

segregating at least a portion of the water component from the waste stream; and

operating the oxyhydrogen gas generator to produce oxyhydrogen-rich gas from the segregated portion of the water component.

4. The method of claim 1 wherein the oxyhydrogen gas generator is operated to produce oxyhydrogen-rich gas from a water source external to the waste stream.

5. The method of claim 1 wherein the unit process includes stabilization.

6. The method of claim 1 wherein the unit process includes disinfection.

7. The method of claim 1 wherein the unit process includes floatation.

8. The method of claim 1 wherein the unit process includes conditioning.

9. The method of claim 1 wherein the waste stream comprises municipal wastewater.

10. The method of claim 1 wherein the waste stream comprises municipal wastewater biosolids.

11. The method of claim 1 wherein the waste stream comprises activated sludge.

12. The method of claim 1 wherein the waste stream comprises industrial wastewater.

13. The method of claim 1 wherein the waste stream comprises chemical processing effluent.

14. The method of claim 1 wherein the waste stream comprises animal waste.

15. The method of claim 1 wherein the waste stream comprises paper mill effluent.

16. The method of claim 1 wherein the waste stream comprises landfill leachate.

17. The method of claim 1 wherein the waste stream comprises marine wastewater.

18. The method of claim 1 wherein the waste stream comprises environmental contaminate remediation process effluent.

19. The method of claim 1 wherein the waste treatment system includes a wastewater treatment plant.

20. The method of claim 19 wherein the waste stream includes wastewater biosolids.

21. The method of claim 20, wherein the unit process includes thickening of the waste stream or floatation of the wastewater biosolids.

22. The method of claim 20, wherein the unit process includes stabilization of the wastewater biosolids.

23. The method of claim 20 wherein the second use of the oxyhydrogen-rich gas includes combustion for incinerating the wastewater biosolids.

24. The method of claim 1 wherein the second use includes using the oxyhydrogen-rich gas as a fuel for combustion.

25. The method of claim 24 wherein the combustion produces heat, and the produced heat is recovered for use within the waste treatment system.

26. The method of claim 24, wherein the combustion produces an exhaust including water vapor, and further comprising the step of:

condensing the water vapor from the combustion exhaust for use within the wastewater treatment facility.

27. The method of claim 1, wherein the second use includes power generation.

28. The method of claim 1 further comprising the step of separating the oxyhydrogen-rich gas into an oxygen-rich component and a hydrogen-rich component.

29. The method of claim 28 wherein the second use includes converting at least a portion of the oxygen-rich component to ozone for use in disinfecting an effluent of the waste treatment system.

30. The method of claim 28 wherein:

the waste treatment facility includes an oxygen demand; and

the second use includes using the oxygen-rich component to fulfill at least a portion of the oxygen demand.

31. The method of claim 28 wherein the second use includes using the hydrogen-rich component as a fuel source.

32. The method of claim 1, wherein the oxyhydrogen gas generator is submerged within the waste stream.

33. The method of claim 1, wherein the step of operating the oxyhydrogen gas generator includes the steps of:

submersing at least a pair of closely-spaced electrodes in the waste stream; and

supplying a pulsed electrical signal to at least one of the electrodes.

34. A system for treating a waste stream having a water component, comprising:

a gas generator configured and arranged to produce an oxyhydrogen-rich gas from the water component of the waste stream;

a first unit process for treating the waste stream in which at least a portion of the waste stream is contacted with at least a portion of the oxyhydrogen-rich gas; and

a second unit process separate from the first unit process and in which at least a portion of the oxyhydrogen-rich gas is utilized for treatment of the waste stream.

35. A system according to claim 34, wherein the first unit process includes stabilization and the second unit process includes disinfection.

36. A method for treating wastewater biosolids in a wastewater treatment facility, the wastewater biosolids having a water component, the method comprising the steps of:

implementing a gas generator into the wastewater treatment facility to produce oxyhydrogen-rich gas from the water component of the wastewater biosolids;

contacting a least a portion of the produced oxyhydrogen-rich gas with at least a portion of the wastewater biosolids to conduct a unit process for treating the wastewater biosolids; and

conveying at least a portion of the produced oxyhydrogen for a second use within the wastewater treatment facility.

37. A method for incinerating a waste stream, the method comprising the steps of:

operating an oxyhydrogen gas generator within the waste treatment system to produce oxyhydrogen-rich gas;

contacting at least a portion of the oxyhydrogen-rich gas with at least a portion of the waste stream to conduct a unit process treating the waste stream in preparation for incineration; and

conveying at least a portion of the waste stream and at least a portion of the oxyhydrogen-rich gas to an incinerator, wherein the incinerator uses the oxyhydrogen-rich gas as a fuel source to incinerate the waste stream.

38. The method of claim 37, wherein the oxyhydrogen-rich gas fuel source provides sufficient energy to incinerate the waste stream without inputting a separate energy source.

39. The method of claim 37, wherein the oxyhydrogen-rich gas fuel source provides sufficient energy to incinerate the waste stream without substantially reducing a water content of the waste stream.

40. The method of claim 39, wherein the waste stream incinerated includes less than 20 percent solids.

41. A method for stabilizing biosolids in a waste stream, comprising:

submersing at least a pair of closely spaced electrodes in a waste stream including a biosolids and a water component, the electrodes bordering an interaction zone extending therebetween;

applying a pulsed electrical signal to at least one of the electrodes, thereby generating oxyhydrogen-rich gas from the water component of the waste stream, the oxyhydrogen-rich gas forming bubbles in the interaction zone that rise to a surface of the waste stream;

contacting a substantial amount of the biosolids with at least some of the bubbles as the bubbles rise through the waste stream; and

trapping the oxyhydrogen-rich gas above the surface of the waste stream.

42. A method for separating solids from a waste stream, comprising:

submersing at least a pair of closely spaced electrodes in a waste stream including solids and a water component, the electrodes bordering an interaction zone extending therebetween;

applying a pulsed electrical signal to at least one of the electrodes for a first interval, thereby generating oxyhydrogen-rich gas from the water component of the waste stream, the oxyhydrogen-rich gas forming bubbles in the interaction zone that rise to a surface of the waste stream; and

removing the pulsed electrical signal from the electrodes for a second interval to thereby allow the solids to collect at the surface of the waste stream.

43. The method of claim 42, further comprising removing the collected solids from the surface of the waste stream.

44. The method of claim 42, further comprising repeating the steps of applying the pulsed electrical signal and removing the pulsed electrical signal.